Downloaded from orbit.dtu.dk on: May 05, 2023

DTU Library

Energy access realities in urban poor communities of developing countries: assessments and recommendations

Report prepared for the Global Network on Energy for Sustainable Development (GNESD) by the Energy and Resources Institute (TERI) and the GNESD Secretariat. Summary for policy-makers

Singh, Rozita; Wang, Xiao; Ackom, Emmanuel; Reyes, Juan

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Singh, R., Wang, X., Ackom, E., & Reyes, J. (2015). *Energy access realities in urban poor communities of developing countries: assessments and recommendations: Report prepared for the Global Network on Energy for Sustainable Development (GNESD) by the Energy and Resources Institute (TERI) and the GNESD Secretariat. Summary for policy-makers*. Global Network on Energy for Sustainable Development (GNESD). GNESD-SPM-UPEA III No. 01/2015

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

2015

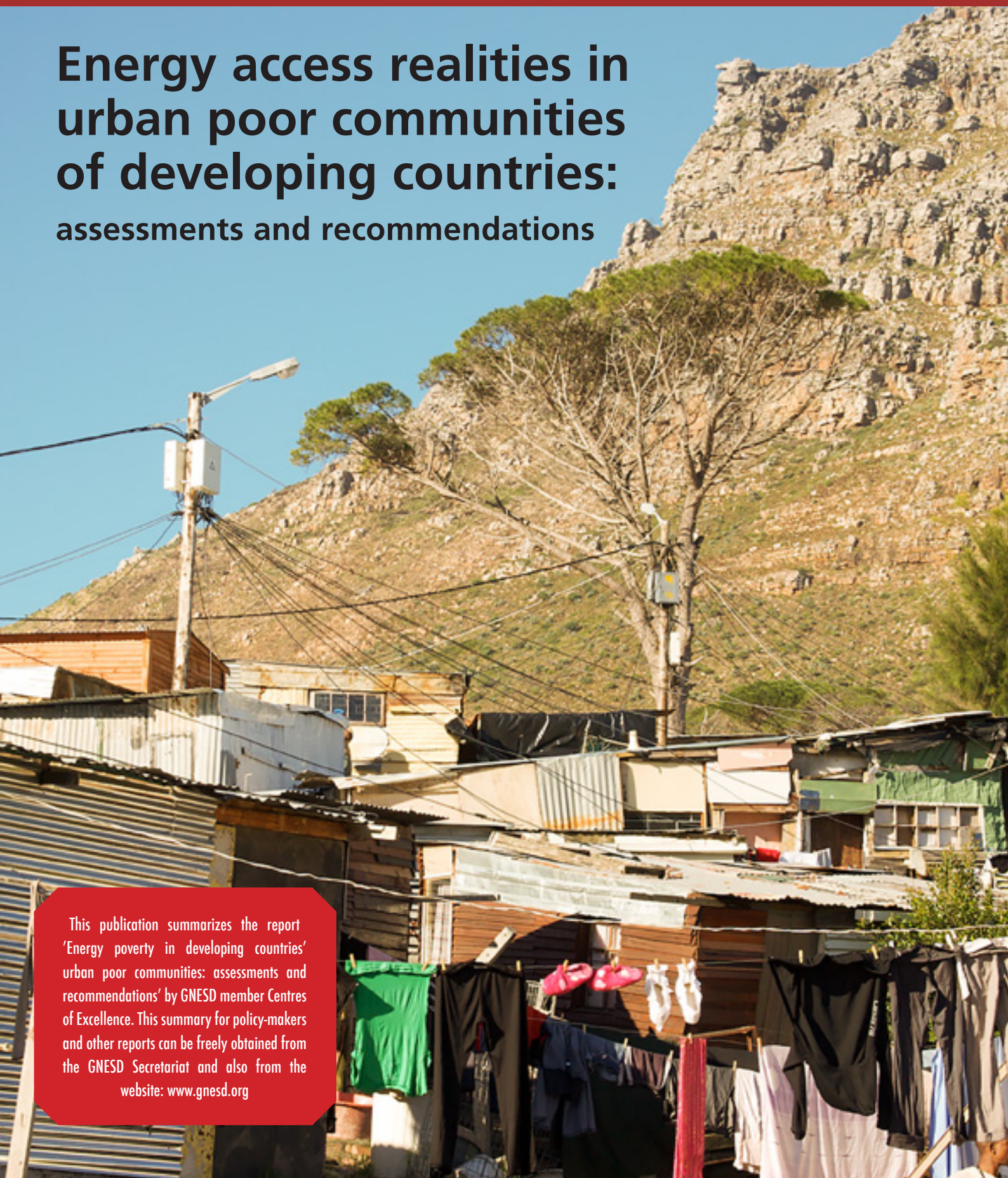
GNESD

GLOBAL NETWORK ON ENERGY FOR SUSTAINABLE DEVELOPMENT

UNEP

Energy access realities in urban poor communities of developing countries:

assessments and recommendations



This publication summarizes the report 'Energy poverty in developing countries' urban poor communities: assessments and recommendations' by GNESD member Centres of Excellence. This summary for policy-makers and other reports can be freely obtained from the GNESD Secretariat and also from the website: www.gnesd.org

GNESD

UNEP

Energy access realities in urban poor communities of developing countries: assessments and recommendations

This publication summarizes the report 'Energy poverty in developing countries' urban poor communities: assessments and recommendations' by GNESD member Centres of Excellence. This summary for policy-makers and other reports can be freely obtained from the GNESD Secretariat and also from the website: www.gnesd.org.

UNEP DTU PARTNERSHIP

DTU

SUSTAINABLE ENERGY FOR ALL

Front cover

Imizamo Yethu, South Africa. Photo by Gordon Mackenzie, UNEP DTU Partnership.

Design, layout and production by

Phoenix Design Aid A/S, Denmark. ISO 14001/ISO 9000 certified and approved CO_2 neutral company – www.phoenixdesignaid.com.

Printed on environmentally friendly paper (without chlorine) with vegetable-based inks. The printed matter is recyclable.

Global Network on Energy for Sustainable Development (GNESD)

GNESD is a UNEP-facilitated network of Centres of Excellence dedicated to improving energy access for the poor in developing countries and helping those countries with energy access policy recommendations to achieve their Millennium Development Goals (MDGs). The current member Centres of Excellence from developing and emerging economies include those of China, India, Thailand, Brazil, Argentina, South Africa, Kenya, Senegal and Tunisia. The network members are all renowned institutions in energy topics. GNESD membership facilitates coordinated analytical work, the exchange of information and policy analysis on environmentally benign energy-policy options relevant to national and regional governments.

Research findings produced by the network are freely available to governments and regional organizations for formulating policies and programmes. The private sector can also use these findings in their efforts to attract investments.

GNESD activities are based on the firm belief that access to affordable, modern energy services is a pre-requisite for sustainable development and the alleviation of poverty. These activities are designed to:

- Strengthen South-South knowledge exchange and collaboration on environmentally benign energy access issues;
- Create a communications infrastructure that makes it easier for member centres to share experience and draw on each other's strengths, expertise and skills; and
- Engage member centres more actively in national and regional policy dialogues and outreach activities.

GNESD is one of several Type II partnerships in the field of energy that were launched at the World Summit on Sustainable Development (WSSD) in Johannesburg, September 2002.

Funds for GNESD activities had been made available by the governments of Germany and Denmark. In the past it has also obtained support from France, Italy and the United Kingdom. The network also receives support from the UN Foundation, UNDP and REEEP.

The GNESD Secretariat is hosted at the UNEP DTU Partnership.

For more information, please visit GNESD's website:
www.gnesd.org

Suggested Citation

Singh, R., Wang, X., Ackom, E.K., Reyes, J.C.M. 2015. Energy access realities in urban poor communities of developing countries: assessments and recommendations. Report prepared for the Global Network on Energy for Sustainable Development (GNESD) by the Energy and Resources Institute (TERI) and the GNESD Secretariat. Summary for policy-makers. GNESD-SPM-UPEAI-II-01/2015.

This publication may be reproduced in whole or in part and in any form for educational and non-profit purposes without special permission from the copyright holder, provided GNESD is acknowledged. GNESD would appreciate receiving notification or a copy of any publication that uses this publication as a reference. No part of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from GNESD.

Disclaimer

The opinions and recommendations expressed in this report are those of the authors and do not necessarily reflect those of UNEP, UN-Energy or GNESD. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of UNEP, UN-Energy, UNEP DTU Partnership, DTU or GNESD concerning the legal status of any country, territory, city or area or of its authorities. References to different sources have been made in this document; for full references please refer to the full country reports. This publication and other GNESD publications can be downloaded from www.gnesd.org.

ISBN: 978-87-93130-21-0

Acknowledgement

This Summary for Policy-Makers (SPM) is derived from country reports prepared by GNESD Member Centres of Excellence. The SPM was written by Rozita Singh, Xiao Wang, Emmanuel Ackom and Juan Reyes. We would like to thank Mathilde Pedersen for her support in helping to liaise with reviewers during the early stages of the UPEA III work. Additionally, we thank our colleagues from TERI including Shabana Charaniya, Divya Sharma, Akshima Ghate and Pravin Agarwal for coordinating the urban and reviewing the peri-urban energy access (UPEA III) study. Our profound gratitude to GNESD member centres that participated in the UPEA III study and to all GNESD member centres for reviewing this SPM. Our appreciation to Gordon Mackenzie for invaluable comments he provided on the draft version of this SPM and to our communication and outreach team, Mette Rasmussen and Surabhi Goswami for their great work in getting this SPM formatted and printed. Special thanks also to John Christensen for providing general direction and oversight throughout the UPEA III study. This paper was led (and co-authored) by Emmanuel Ackom of the GNESD Secretariat.

GNESD members who authored the country reports that provided important background information in preparing this SPM include:

Africa

Environment and Development Action in the Third World (ENDA-TM) is a non-governmental organisation based in Dakar, Senegal. Its activities are aimed towards contributing to a better technical, economic and sociocultural understanding of energy issues in African countries (authors: Touria Dafrallah, Abdou Ndour, Abdou Diop and Mansour Diagne).

The Energy, Environment and Development Network for Africa (AFREPREN/FWD), Nairobi, Kenya, brings together 106 energy researchers and policy-makers who have conducted policy studies in nineteen African countries (authors: Stephen Karekezi, Jared Otuke, Godfrey Kanyanta).

Energy Research Centre (ERC), University of Cape Town, South Africa, is a leading institution for the development of African energy and energy-environment policies (Authors: Gisela Prasad, Louise Tait, Holle Wlokas).

Latin America

The Bariloche Foundation, Rio Negro, Argentina, is a private, non-profit institute founded in 1963 focussing on research, training, technical assistance, diffusion and other activities in the area of energy and the environment (authors: Daniel Hugo Bouille, Rocio Araoz Sandoval, Raul Landaveri).

The Brazilian Reference Center on Biomass (CENBIO/IEE/USP), founded in 1996, is a group of researchers in bioenergy located at the University of São Paulo, in the Institute of Energy and Environment (authors: José Goldemberg, Suani Teixeira Coelho, Manuel Moreno).

Centre for Integrated Studies on Climate Change and the Environment (Centro Clima/COPPE/UFRJ), established in 2000 in Brazil, is a specialized centre in the research and development of projects and scientific studies in the fields of climate change and the environment (authors: Emilio Lèbre La Rovere, André Felipe Simões).

POLICOM/POLI/UPE is the Polytechnic School of the State University of Pernambuco, Brazil (author: Sergio Peres).

Asia

The Asian Institute of Technology (AIT), Thailand, promotes technological change and sustainable development in the Asia-Pacific region through higher education, research and outreach (authors: S. Kumar, P. Abdul Salam, Pujan Shrestha).

The Energy and Resources Institute (TERI) is a research institute located in New Delhi, India. It carries out research in the fields of energy, environment and sustainable development (author: Shabana Charaniya).

For more information on this document, please contact:

Emmanuel Ackom, Programme Manager, Global Network on Energy for Sustainable Development (facilitated by UNEP) Tel.: +45 4533 5289 Email: emac@dtu.dk, www.gnesd.org

Background

Nearly 1.3 billion people continue to remain without access to electricity, and 2.6 billion do not have access to clean cooking facilities (IEA 2013). The energy access needs of rural populations have been much researched and are the priority of many policies and global programmes. However, today more than half of the world's population lives in urban areas. About 75% of the world's consumption of commercial energy contributes to urban areas, and many of those in direst need of access to modern energy systems are located in rapidly growing informal urban settlements throughout the developing countries (UNDA Projects 2011). The urgent needs of the urban poor in obtaining access to affordable and modern energy services have not been properly addressed in most developing countries.

There is a wide gap in terms of understanding the existing situation of clean energy access to the urban poor, the barriers to energy access and possible solutions to address this challenge. With the objective of addressing this gap, the Global Network on Energy for Sustainable Development (GNESD) initiated research on the theme of Urban Peri-Urban Energy Access (UPEA) in 2006 through its member centres in Africa, Asia and Latin America.

UPEA Phase III further develops the work done in previous phases by identifying the specific demand- and supply-side barriers to energy access, analysing urban and energy policies, and recommending operational measures to address these barriers. Besides pointing out the key barriers, the study has also identified potential solutions and good practices that have improved energy access in some way or another. Thus, the study offers policy-makers and supply agencies a comprehensive view of the clean energy access situation in urban and peri-urban areas and provides policy suggestions for improvements. One of the key points to take from this study has been the recognition of the importance of issues and policies beyond energy which are equally critical for addressing barriers to energy access.

Research Framework

The UPEA III study involved conducting a policy review, identifying demand- and supply-side barriers and documenting good practices. Active engagement with stakeholders was sought through structured interviews and policy dialogue panels. To achieve the stated research objectives, a research framework was developed that included the following key components:

Background of the urban poor. The objective was to document study area characteristics like demography, urbanization, profile of the urban poor and the situation of clean energy access to the urban poor community. This section involved:

- Studying urban poor settlement characteristics in the study area, like average income levels, occupations, ownership of secure tenure, illegal connection status, availability of basic services [i.e. water, sewage, waste management, health, education, sanitation, and energy], etc.
- Analysing the existing relevant sectoral policies related to energy, urban planning and poverty alleviation to identify institutional gaps regarding energy planning for the poor.

Access to legal and cleaner energy by the urban poor. This involved finding responses to the following research questions:

- What are the main types of energy sources, and what is the availability for cooking and lighting used by the urban poor?
- How is the energy procured (i.e. legally or illegally)?
- What are the key issues of energy access i.e. tenureship[1], affordability, lack of infrastructure, etc.?

Energy planning for the urban poor. Identification and revision of key plans, policies and programmes for the urban poor with the objective of evaluating whether energy access for the urban poor is being adequately addressed in these plans, policies and programmes.

Supply-side barriers. Identification of the agencies involved directly or indirectly in the energy supply chain to understand their role, the barriers they face in supplying energy to the urban poor and possible options to remediate them.

Demand-side barriers. Identification of the demand-side barriers and the steps undertaken by the service providers to address them.

Good practices. Collection and compilation of existing good practices, i.e. successful policies and initiatives that have supported or enabled energy access for the urban poor in their regions. These were utilised in framing the recommendations.

1 Tenureship refers to legal recognition of settlements.

Contents

Summary

Imizamo Yethu, South Africa. Photo by Gordon Mackenzie, UNEP DTU Partnership.

The UPEA III study was conducted with the aim of presenting a comprehensive view of the energy access situation of the poor urban and peri-urban population in developing countries. Through analysing urban development and energy policies, a failure to recognize energy as a basic service has been identified as a major gap. One of the measures to overcome this gap would involve exploring existing low-income housing programmes as entry points for enabling clean energy access to the urban poor. The study observed that there is a need for proper guidelines to define the roles and responsibilities of nodal agencies that are responsible for energy provision. The energy subsidy programmes in the study areas were also reviewed in order to capture key lessons learned. As part of the study, several demand-side barriers faced by poor households in accessing clean energy were identified. In the case of electricity these included lack of affordability, lack of trust of authorities and lack of awareness. For LPG, the barriers identified were lack of affordability, safety hazards, low quality of service and lack of willingness to shift from traditional cooking fuels. Similarly, interviews and discussions with supply agencies helped in identifying the key supply-side barriers. In the case of electricity, the supply-side barriers identified were lack of tenureship and location specific barriers, lack of proper planning and coordination at the institutional level and lack of policies, plans and programmes that consider energy efficiency in low-income households. For LPG, these barriers were lack of proof of address, safety hazards and inefficient supply and distribution.

The study also identifies potential solutions and presents good practices that have addressed these barriers and improved energy access in some way or the other. As a key result of the UPEA study, policy recommendations at the macro-level have also been proposed. These action points intend to serve as an input for policy-makers and other key stakeholders working towards the goal of improving clean energy access to the urban poor. These have been summarized as follows (for a more detailed analysis for each of them, please refer to the corresponding section in this summary report).

Key recommendations and corresponding action points from the study

Recommendation 1. *Recognise electricity as a basic service and provide enabling conditions for clean energy access*. This recommendation encourages national governments to integrate energy access with progressive housing policies and other urban-related policies, especially when related with slum upgrading programmes.

Recommendation 2. *Define clear roles and responsibilities for the nodal agencies responsible for energy provision.* National governments should carve out clear institutional mechanisms, roles and responsibilities, and coordinate the appointment of nodal agencies in the framework of energy policy.

Recommendation 3. *Create a database on the urban poor*. Through coordinated efforts, national governments and NGOs could build a database on urban energy access based on variables such as coverage, available services, infrastructure, energy consumption, share and patterns of utilities usage, among others. This database can be utilised for developing targeted policies, financing schemes and incentives.

Recommendation 4. *Incorporate monitoring and evaluation mechanisms in policy planning*. National governments should close the gaps between the design and delivery phases of their policies by incorporating monitoring, evaluation and verification mechanisms into the policy itself. This will improve the quantity and quality of energy service and enable better price control.

Recommendation 5. *Relax the requirements of tenure for new electricity connections and access to LPG*. National governments, in conjunction with supply agencies, should promote and allow alternative forms of proof of address to facilitate legal connections to electricity and improved access to LPG. Items of proof like voter ID cards and affidavits from local ward councillors are suggested.

Recommendation 6. *Promote increases in affordability.* Supply agencies should introduce mechanisms and measures to improve end users' capacity for dealing with upfront costs. These mechanisms could include monthly instalments and prepaid connections, as in the examples described in the study.

Recommendation 7. *Expand and maintain supply infrastructure*. Through expansion and maintenance of the current grid and LPG supply chain, it is important to make adaptations according to the growing energy demand of urban and peri-urban areas.

Recommendation 8. *Recognise urban poor populations as potential energy customers*. Both supply agencies and utility companies should link city distribution rights to mandatory electrification of low-income urban settlements, recognising the urban poor population as potential energy consumers.

Recommendation 9. *Promote safety and energy efficiency by conducting awareness programmes which involve other social stakeholders.* Involving NGOs and local communities in conducting awareness and information campaigns is recommended to inform the urban poor about safety measures, and efficient electricity and LPG use.

Recommendation 10. *Promote and foster the use of renewable energy sources.* National governments, NGOs and the private sector should introduce pilot off-grid renewable energy programmes in urban poor settlements. Low-cost and efficient appliances should be provided to the urban poor at subsidised rates.

What do urban development and energy policies point towards?

A review of existing policies related to urban development and energy access was conducted in UPEA Phase II and Phase III to understand the focus of the policies and explore whether the problem of clean energy access for urban poor populations has been addressed. The review indicated that poverty alleviation and urban development policies have a component on urban poverty that aims at the provision of basic needs services like housing, water supply etc. to the urban poor. However, clean energy is still not recognised as a basic urban service in these policies in most developing countries.

Analysis of Urban Development Policies

The National Housing Policy of Kenya and the low-income housing programme of the National Housing Authority in Thailand indicate that slum upgrading programmes and housing policies can play a crucial role in addressing the energy access needs of the urban poor (GNESD 2013). Both programmes (either through the upgrading of old houses or by building new units) ensure access to electricity, as residents under these programmes do not need to make separate arrangements for electricity connection themselves. These examples show that including clean energy sources as part of basic slum infrastructure and services not only improves living conditions and the quality of life, it also has the potential to reduce energy poverty as well.

The study therefore recommends the need to explore existing affordable and low-income housing programmes as a means for enabling clean energy access to the urban poor population. Existing policies and programmes can offer several entry points, for instance, the Programme for Housing Improvement and Basic Infrastructure in Argentina, the National Urban Housing and Habitat Policy in India and the '*Minha Casa Minha Vida*'[2] campaign in Brazil.

Analysis of energy policies: subsidised electricity tariffs

Various energy-sector policies at the national level were found to have prescribed certain targets for electrification, primarily focussed on rural areas or universal in nature. A lack of vision and guidelines was observed in the study areas when it came to defining the nodal agencies for meeting the energy needs of the urban and peri-urban population. Though many policies have focussed on increasing the affordability of energy services by means of subsidised tariffs, it is difficult to define how successful have they been.

For instance, in 2003, the government in South Africa introduced the Electricity Basic Services Support Tariff (EBSST), also known as Free Basic Electricity (FBE), funded by the national government. The tariff aims to assist poor households that are eligible for services and with a record of monthly electricity consumption being less than 450kWh. These households were provided with a subsidy of 50kWh free electricity units per month. However the implementation of EBSST has been fraught with difficulties because of the various pricing and delivery restrictions imposed by the plethora of distribution agencies (GNESD 2013d).

Analysis of energy policies: subsidy on LPG cylinders

For LPG, despite there being policies focusing on subsidies, it was observed that the poor are unable to afford it. For instance, in Senegal, in order to address the problems of deforestation, environmental degradation and the increasing scarcity of traditional fuels, the Senegalese Government decided to launch a 'butanization programme' (1974) aimed at replacing 50% of fuel wood (charcoal) consumption with LPG in major urban areas. From July 1999 onwards, the subsidy on LPG was gradually reduced by 20% a year, and in 2011 it was totally removed. Due to the informal nature of their livelihoods, most of the urban poor in Senegal were unable to afford the required infrastructure, such as the initial appropriate stoves, or the refilling of the gas container.

2 My House, My Life.

The subsidized 2.75 and 6 kg cylinders, which were to benefit the poor, have instead been overwhelmingly used by the middle and upper middle classes, who have sustained purchasing power (GNESD 2013c).

In India, most of the subsidies (USD 0.02/kWh[3] for electricity and USD 9.40[4] per LPG cylinder) are targeted at all end users and with no special focus on the urban poor (GNESD 2013f). According to the 2011 census, while 65% of urban Indian households use LPG, only 11% of the households in rural areas are able to secure it. Overall, LPG is used by only 28.5% of Indian households for cooking[5] (GNESD 2013).

One success story from Thailand shows that local LPG prices have been capped for many years based on a wholesale price of USD 333 per tonne.[6] This implies that there is approximately a 64% (i.e., USD 601) subsidy per tonne of LPG. Apart from the financial incentive, there are also other initiatives that have improved access to LPG for the poor. LPG cylinders are available in small sizes (3-4 kg) suitable for small and congested settlements. Not only the authorized LPG distributors, but also local grocery shops are allowed to sell LPG cylinders. Other services offered, including doorstep delivery, allowing different brands of cylinders to be swapped and assistance for first-time users to install LPG cylinders, have been crucial in achieving the high rate of access to LPG in Thailand (GNESD 2013).

Lessons for energy planning for the urban poor

Despite the subsidies, significant sections of the urban poor population are still struggling to incorporate the cost of clean energy (electricity and LPG) into their household budgets. In other cases, the study noted that the subsidies have not been channelled to the intended beneficiaries. It is in these cases that urban poor households have to resort to secondary fuels like kerosene and charcoal, which are unclean sources of energy and major causes of poor indoor air quality.[7] Thus, it is essential to include clean energy sources, electricity for lighting and LPG for cooking as an integral part of basic physical infrastructure services for the urban poor. During the course of the study, examples of a few progressive policies also showed a way forward and proved that it is possible to increase energy access for the urban poor by recognising energy as a basic service. For example, Thailand's periodic National Economic and Social Development Plans (NESDPs) were crucial in constructing houses for low- income groups and upgrading slums to provide basic services such as water supply, electricity, etc. (GNESD 2013). *Some other good practices and initiatives have been highlighted in the following pages.*

3 Under the Delhi Electricity Subsidy Scheme, the government of Delhi has been providing a subsidy of USD 0.02/kWh (normal charge for electricity up to 200 kWh is USD 0.06/kWh) to all those domestic consumers whose monthly consumption of electricity does not exceed 200 kWh.

4 USD 7.60 is a subsidized price for LPG cylinders, the market price of an LPG cylinder being USD 17. LPG is a subsidized fuel, and hence all the domestic users enjoy a subsidy of USD 9.40.

5 http://www.moneylife.in/article/lpg-a-mockery-of-subsidy-reduction-efforts-or-unadulterated-politics/30315.html

6 Exchange rate as of January 2013: 1 US Dollar = 30.13 Thai Baht.

7 Indoor air pollutants (CO, SO_2, NO_2, RSP) can cause a range of health problems, importantly contributing to chronic respiratory diseases. Indoor pollutants can reach dangerous levels as dilution in the space is often minimal from poor ventilation (which is often a characteristic of urban poor settlements).

Barriers to Energy Access

For the UPEA III study, two clean sources of energy were considered: electricity for lighting, and LPG for cooking. Detailed interviews and discussions with supply agencies in all study areas helped in identifying the key supply-side barriers. These were substantiated by consultative meetings with stakeholders influencing the provision of energy access and services to the urban poor. Stakeholders consulted included representatives of government agencies, local authorities, energy suppliers, housing authorities, regulatory agencies, NGOs, academia and consumers' associations. The demand-side barriers faced by the poor households in accessing clean energy were identified using the information from previous phases, as well as through fresh household surveys conducted as part of Phase III.

Tables 1 and 2 summarize the main demand and supply side barriers to LPG and electricity access for urban poor communities.

Inefficient cooking in peri-urban area, Senegal.
Photo courtesy of ENDA (Énergie- Environnement –Développement).

Table 1. Barriers to energy access (electricity) in study areas and recommendations

Identified barriers		Policy options and measures
Supply side		
Lack of tenureship and location-specific barriers.	The informal nature, illegal status and poor quality of habitats of the urban poor make it difficult for the supply agency to install meters and lay wires for supplying electricity connections.	Integrating slum up-grading and urban habitat policies with energy policies can help address this barrier. The electrification of poor households should be integrated into housing schemes, giving them legal recognition.
Lack of proper planning and coordination at the institutional level.	The utilities lack an efficient organizational structure and fail to invest regularly in power plants and transmission lines in order to cope with the increasing demand from the growing population and economic activities of urban and peri-urban settlements. In other cases (e.g. Senegal), peri-urban zones are not classified as either urban or rural, as a result do not fall under the management of utilities from either of the two zones and are not subject to any specific energy policy.	Efforts to improve or develop the grid and electrical infrastructure to adapt them to demand in urban and peri-urban areas should be undertaken. This will require substantial planning and investment for the maintenance and replacement of the utility company equipment.
Lack of policies, plans and programmes that consider energy efficiency in low-income households.	There is a lack of initiatives to address energy efficiency for low-income households. The existing programmes addressing energy efficiency are unusually reactive (e.g. the changing of light bulbs) rather than proactive (e.g. building materials/orientation, use of space etc.) and may be limited to a few housing units and demonstration projects only.	It is recommended that the energy policy and planning process also gives importance to energy efficiency in urban poor areas and in existing infrastructure, setting realistic targets and putting in place plans and an enabling environment to deliver them in coordination with local communities and NGOs.

Identified barriers		Policy options and measures
Demand side		
Lack of affordability.	High upfront cost of electricity connection and tariff structures, high upfront cost of using high energy-efficient appliances, and the inability to benefit from the subsidised tariff structures due to high usage because of larger household size are some of the features that make electricity unaffordable.	Awareness regarding energy-efficient practices should be generated among households to help them reduce their bills with the help of NGOs and CBOs. Stoves and other formal equipment required for using LPG should be subsidised. Introducing prepaid electricity cards is another approach to addressing this barrier. These allow weekly recharges in line with the household's financial capacities. It also allows consumers to keep a tab on electricity used and avoid issues like overbilling, etc. Community meters can also be installed at a commercial or institutional settlement or any other permanent structure nearby after consulting with the community. A group of community members can be made responsible for maintaining the meters, the distribution of bills to individual households, collection of the bill amount and payment to the supply agency.
Lack of trust towards authorities	If there is a lack of trust and communication between the energy service providers and the urban poor, it can impede energy access. It was observed in many cases that the consumers were not made aware of changes in the electricity supply and bill collection system, which resulted in the development of mistrust and in extreme cases, also resulted in non-payment of bills and subsequent late payment charges.	This barrier can be overcome by involving NGOs in facilitating the interaction of the urban poor community with the supply agencies. Special cells in the slum communities can also be set up to provide information regarding new connections, or to sort out grievances with respect to over-billing, faulty meters, etc. Frequent awareness programmes need to be organized with strong community participation.
Lack of awareness	Lack of awareness on energy efficiency practices and government programmes and subsidy policies, prevents the poor to use energy efficiently and hence escalates their energy bills.	NGOs and community organizations can be involved to raise awareness in each slum community informing and helping them to legally acquire the electricity services through various subsidy/social programmes available. Awareness regarding the methods of calculation of bill amount should also be spread in order for the households to understand various charges, surcharges, etc.

Source: Adapted from GNESD (2013). *Policy Synthesis Report*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III.

Table 2. Barriers to energy access (LPG) in study areas and recommendations

Identified barriers		Policy options and measures
Supply side		
Lack of proof of address.	One of the prerequisites for acquiring a legal LPG connection is proof of residence. Since in some cases the product needs to be delivered to a consumer's address, the availability of relevant documents becomes critical. Given that in most cases the supply agencies are well aware of the inability of a poor urban household to furnish legal proof of address, they should accept other documents like voters' ID or ration card to issue new connections.	The Thailand model of issuing temporary registration numbers or quasi-household IDs can be replicated. There should be an amendment to the relevant law such that the issuance of such IDs is solely for the provision of basic services and does not create legal entitlement of land to the urban poor.
Safety hazards.	The lack of space and proper ventilation in urban poor households cause safety hazards. In South Africa, Kayagas, a local LPG distributor, faces difficulties in operating in low-income settlements particularly due to the fact that none of the distribution shops comply with fire-safety regulations owing to space constraints (GNESD 2013d).	The establishment of legal or registered LPG distribution shops through local entrepreneurship models should be encouraged in low-income neighbourhoods.
Inefficient supply and distribution	The inefficient supply and distribution chain of clean fuels like LPG impedes its access to the urban poor. In Kenya, the shortage of LPG means rises in the prices of cylinders. If the residents opt to purchase LPG from the nearest supermarkets they incur additional transportation costs (GNESD 2013b). In South Africa, in the study area of Imizamo Yethu, there is no formal distribution network. LPG is available to residents only at a petrol station (in 9kg cylinders) and at a supermarket in Hout Bay which reduces access to this clean source of energy, since there are transport costs involved (GNESD 2013d).	The distribution chains should be enhanced by allowing independent gas retailers to operate in several low-income settlements. Opening outlets near slum areas ensures access to legal and safe LPG without the interference of middlemen, who tend to increase the cost and also compromise on the safety measures.

Identified barriers		Policy options and measures
Demand side		
Lack of affordability.	When purchasing LPG, it requires upfront payments for the fuel and it is not able to be purchased in smaller incremental amounts. The household budget of the urban poor population does not allow them to spend the cost for a month's supply at the beginning of the month.	Introduction of small-size cylinders (e.g.3-5kg) with upfront and refill costs less than the conventional cylinders is a possible way of addressing this barrier. Along with this, the associated cost of accessories such as regulators, burners etc. should also be reduced, thus making LPG an affordable energy source for the urban poor. In order to ensure that the subsidies reach the target population, a card should be introduced that entitles the user to buy the gas cylinder at the price fixed by the government (through the subsidy policy) at any distribution outlet. For instance, India has introduced the 'Aadhaar Card'[8] to facilitate the targeting of subsidy to urban poor households (GNESD 2013f).
Safety hazards.	Both perceived and real concerns over safety and health hazards associated with the use of various energy sources impede access to clean energy sources. The fear of LPG being dangerous caused safety concerns of many households. The prevalence of these notions became a barrier to clean energy access among poor households.	There is a need to increase the frequency of awareness-building programmes. LPG companies should use innovative ways and means to sensitise consumers regarding the safety aspects regarding use of this clean cooking fuel.
Low quality of service.	In Kenya, substantial variation in the volume of gas found in cylinders is a matter of great concern among the urban poor population (GNESD 2013b). In Argentina, slum-dwellers prefer to pay more and use the branded cylinders rather than using the subsidized ones, since the LPG cylinder offered through a subsidy does not contain the prescribed 10kg quantity. Thus they find it more convenient to buy popular branded cylinders and pay a higher price rather than buying the subsidised one (GNESD 2013a).	Introduction of weighing scales at LPG refilling stations protects consumers from under-filled LPG bottles, as seen in Kenya where distributors are doing this to restore consumer confidence. All LPG bottling companies should practice standardization and quality labelling measures (Energy Regulatory Commission, 2009).
Lack of willingness to shift from traditional cooking fuels.	Owing to certain traditional choices, the urban poor have developed specific cooking habits and taste preferences which are not satisfied by using LPG. Thus, they opt to use traditional energy sources like kerosene, firewood and other biomass for the purpose of cooking. This was observed in Thailand and India.	Awareness programmes and informational campaigns involving NGOS and CBOs to sensitise consumers regarding the benefits of using a clean fuel like LPG (instead of kerosene) should be promoted.

Source: Adapted from GNESD (2013). *Policy Synthesis Report*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III.

8 Aadhaar is a unique 12-digit number issued by the government as proof of identity and residence in India. It collects demographic and biometric information to establish the uniqueness of each individual. Through this card, and as part of an ongoing initiative, the government is trying to link the transfer of subsidies directly to the accounts of the poor households.

Success stories: supply agency initiatives and good practices

As part of the UPEA III study, GNESD member centres identified certain good practices and case studies that represent supplier-side initiatives, as well as steps taken by governments and NGOs in the study areas concerned for improving clean energy access of urban poor. These success stories depict initiatives that have addressed, to some extent, the identified barriers to energy access (discussed in the last chapter) and that provide an array of innovative and proactive measures that can be scaled up and replicated (under similar sets of conditions) for improving access to clean energy.

Some of the key good practices and case studies emerging from the study are highlighted below:

Measures to address the barrier of lack of tenureship

Slum household registration programmes

Thailand introduced compulsory household registration in 1956. A household registration document is a prerequisite for obtaining a connection from the electricity distribution utility. The Thai government began to issue temporary registration numbers or "quasi-household IDs" around 1995 (Cook et al. 2005) as a result of a campaign for better recognition of the living conditions of the urban poor, which started in 1987. These quasi-household registrations allow their owners to apply for a legal electricity connection with the relevant utility, besides other benefits. Since the late 1990s, government policy regarding slum communities has also focussed on upgrading slum and squatter settlements within the city through options such as securing rights of tenure and the expansion of services and infrastructure and/or relocation (GNESD 2013a).

Measures to improve the availability of LPG cylinders in urban poor settlements

LPG distribution system: some lessons from Thailand

LPG distribution shops in Thailand are required to obtain permission from local Departments of Energy Business (DOEB). According to a Decree of the Ministry of Energy from 2006, LPG distribution shops need to be isolated (300 metres away from adjacent buildings) and built from refractory materials. However, this permission process is not required for grocery shops. This system helps the owners of grocery shops to avoid the complex process of application and to have lower investment costs. The availability of LPG cylinders in the grocery shops has led to the increased and easier access of LPG to the population, including the urban poor. The statistics from the Energy Policy and Planning Office (EPPO) showed that there were over 600 retail LPG outlets in Greater Bangkok (energy policy and planning office) in 2001. About 10,000 grocery shops and 5,000 retail outlets registered with the DOEB (Thairath 2011) distribute LPG cylinders widely in Thailand (GNESD 2013a).

Measures to address the barrier of lack of trust

A) Multi-stakeholder collaboration to achieve slum electrification

In 1998, the Ahmedabad Municipal Corporation (AMC) initiated a slum networking project (SNP) called *Parivartan* (literal meaning 'change') with a view to providing physical infrastructure to the slums, including sanitation, road and water facilities. Following the success of the SNP, the beneficiary slum communities demanded electricity connections. To facilitate this, the NGOs SAATH and the Gujarat Mahila Housing SEWA Trust (MHT), already deeply involved in slum upgrading programmes in the city, approached the Ahmedabad Electricity Corporation (AEC) and others to launch the slum electrification programme.

The pilot phase initially targeted 700 households in five slums from the *slum networking programme* of the Ahmedabad Municipal Corporation. Each household in the selected slum areas was provided with a legal private meter and a compact fluorescent bulb. Bill collection centres were set up in CBO offices, post offices, *panchayat* offices, gas agency's offices, civic centres, and so on. Mobile bill collection centres were also started. After the pilot phase, USAID provided additional grant to electrify another 2,000 slum households. This objective was accomplished by the end of 2003. The project involved a collaborative stakeholder engagement where AEC, the utility, provided electricity connections and

supplied the electricity, while the two NGOs, SAATH and MHT, led the project by facilitating community engagement in it and acting as primary coordinators between AEC and AMC. The CBOs supported the project as chief communication channels and enabled a rapport to develop between the utility and the community by acting as nodal points for the exchange of information. USAID provided financial assistance in the pilot phase of the project, and AMC provided the certificate of non-eviction to the slum communities, a prerequisite for their receiving electricity connections (ESMAP 2011).

B) Establishing relations of mutual trust between customers and supply agency

In Brazil, the electrical distribution company COELBA financed and coordinated a *'COELBA Community Agent'* project to reduce the number of illegal connections and promote energy-efficient initiatives for low-income areas in the city of Salvador. This was facilitated by a local NGO, *Cooperação para o Desenvolvimento e Moradora Humana* (CDM). The overall goal was to balance the relationship between customers and the company and consequently establish their mutual trust. The objectives consisted of reducing the number of illegal connections and adjusting the cost of energy consumption of low-income consumers to their affordability, together with increasing utilisation of government subsidies (the social tariff) through increased awareness (GNESD 2013g). Within a decade, "Agente COELBA has expanded from reaching 6,000 households in 2000 to 200,000 households in Salvador alone in 2010. Direct employment created has grown from 6Community Agents in 2000 to 102 in 2010, involving 200 technicians" (ESMAP 2011).

Measures to address the barrier of lack of affordability

A) Promoting prepaid electricity meters

In Argentina, the distribution company *Empresa Distribuidora y Comercializadora Norte S.A.* (EDENOR) implemented the Prepayment Meter Project in the areas of Escobar and Merlo in 2002 and 2003 respectively. Each user purchases a certain number of electricity units (kWh) that he wishes to consume and can pay for. He can divide the purchase into small amounts too, so that the payment scheme is affordable to him. Once this quantity has been consumed, he recharges. Around 5,000 prepayment meters were installed (representing 1% of slum households in GBA), with wide acceptance among the system's users (96%). Electricity consumption was reduced by 35% in relation to users under the same socioeconomic conditions due to a more rational use of energy (GNESD 2013e).

Prepaid electricity meters were introduced for all new connections under the Integrated National Electricity Programme (INEP) in South Africa. Earlier, credit meters were generally mounted on the external walls of dwellings, which were accessed by unauthorised users. Prepaid meters are now mounted inside the dwellings, offering both security and the possibility for consumers to monitor the consumption of the appliances they use. These meters also reduce the problem of non-payment. Virtually all connected households in the study area, Imizamo Yethu, rely on pre-paid electricity. There are various places where one can purchase electricity units, for instance supermarkets, petrol stations, and also through independent Flash agents. One of the successful cases of the flash agents named Flashcow, it is an innovative system developed by a local cell-phone operator whereby electricity can be bought via cell-phones (GNESD 2013d).

B) Reducing upfront costs

Kenya has introduced a 6kg gas cylinder, which has reduced the upfront costs of the cylinder and associated gas burner and also allowed the poor to purchase gas in smaller quantities more commensurate with their income levels (*The East African* 2012). The introduction of low quantity refills to a minimum of 1 kg has made it possible for low-income earners to access cooking gas. Similarly in India, 5kg cylinders have recently been introduced as part of an 'LPG for all'[9] initiative, while in Thailand cylinders up to 3 kg in size are available.

In Kenya, a programme known as "Stima Loan" (an electricity loan) allows new customers to pay 20% of the upfront connection fee and the balance in monthly instalments (ranging from 12 to 36 months) at an annual interest rate of 15% (Nyabundi D 2012). Although this approach does not specifically target the urban poor, it has enabled more households to access electricity. In addition, the survey in Kenya identified a '*lifeline tariff*' which subsidizes the cost of electricity where end users consuming less than 50 kWh of electricity are billed at a lower rate.

9 http://articles.timesofindia.indiatimes.com/2013-10-06/bangalore/42762840_1_lpg-distributor-5kg-cylinder-cylinder-refill

Measures to address the barrier of lack of awareness

A) Organizing innovative awareness programmes

A local LPG distributor in South Africa, *Kayagas*, conducts promotional days in townships with cooking demonstrations and awareness programmes informing people about the benefits and safety of gas. These actions allowed the company to address demand barriers as part of their business model and to facilitate the expansion of LPG usage. By increasing awareness, end users have benefited from a wider variety of options when making energy choices.

For this purpose, Kayagas started a dialogue process with the stakeholders involved in the LPG local market. Initial communications with development workers in the town (Imizamo Yethu) made it possible for the company to develop a better approach to people's energy usage patterns and demands and to share the potential benefits in terms of security and costs at the same time. The second step was to find subsidiary suppliers, entering into dialogue with the local shopkeepers (Spaza stores) in order to create a distribution network. Although creating the distribution network was difficult, Kayagas used strategies to foster demand, such as cooking demonstrations with local township dwellers, posters and home visits. The result was a strong distribution network based on the Spaza owners and local needs, enabling residents to perceive access to LPG as more readily and easily available.

B) Promoting (electrical) energy efficiency in households

In Brazil, the electricity utility AES Eletropaulo in *São Paulo* initiated a programme in 2004 called "The Transformation of Consumers into Customers". Under the programme, AES Eletropaulo contributes to reducing energy consumption by replacing incandescent light bulbs with compact fluorescent ones, as well as replacing refrigerators in a precarious state, installing smart showers and renovating internal electric installations in houses in poor condition. By 2010, the company had regularized 411,039 connections, benefiting 1.64 million people in 991 of the 2,200 low-income communities in its concession area. A similar initiative was introduced in the target area of Paraisópolis in 2005 through a Global Development Alliance partnership with the International Copper Association (ICA) and USAID. Known as the "Slum Electrification and Loss Reduction (SELR) programme", the project undertook a number of measures to increase household efficiency. Energy audits, as one of the measures, encourages each household to identify energy efficiency opportunities. Total project cost was $2.52 million.[10] A 2 million kWh energy savings annually is expected to be yield by households and distribution network taking the energy efficiency measures. (GNESD 2013g).

10 AES-Eletropaulo picked up the bulk of the project costs, including the distribution network upgrades, metering, consumer registration and new refrigerators (with the ICA). The ICA paid for the efficient transformers, rewiring of households and the preparation of a financial model. USAID covered the community campaign costs, audits of each household and selected commercial customers, purchases of CFLs (with AES-Eletropaulo), post-project survey, and efficiency recommendations to targeted commercial customers.

Concluding policy recommendations

The culmination of three phases of research undertaken as part of the Urban and Peri-Urban Energy Access theme highlights the need to introduce macro-level interventions at the strategic energy planning level. The UPEA III study, besides identifying the key supply and demand side barriers, also identified potential solutions and good practices from the study areas that highlight certain measures undertaken to address some of the identified barriers. While barrier-specific recommendations were enlisted for micro-level interventions (*refer to the full synthesis report*), this section highlights the macro-level interventions for policy-makers and other key stakeholders working towards the goal of improving clean energy access to the urban poor.

1. Recognise electricity as a basic service and provide enabling conditions for clean energy access

The study observed that the focus of the prevailing urban policies, plans and programmes for the poor is on the improvement of urban poor settlements and the provision of housing. Realising this, the study builds a strong case for recognising electricity as a basic urban service and promoting enabling conditions for its provision in poor urban settlements. This can be made possible by integrating this service into progressive housing policies and slum upgrading programmes. For instance, slum upgrading projects have the potential to remove the physical and structural barriers to the provision of legal, clean energy supply (GNESD 2013).

2. Clearly define the roles and responsibilities of nodal agencies responsible for energy provision

Implementing the first recommendation is only the first step; the second recommendation is based on the principle of effective institutional mechanisms. It is recommended that, after recognizing electricity as part of the basic physical infrastructure, national governments should carve out clear institutional mechanisms, roles and responsibilities and coordinate the appointment of nodal agencies within the framework of their energy policies.

The nodal agencies should be entrusted with the responsibility for supporting poor urban families in acquiring new legal energy connections and extending full cooperation and support for the transition to a clean energy source. This should be accompanied by the capacity development of local authorities, service providers and community development organizations to improve their energy access and energy efficiency services to the urban poor (GNESD 2013). The study observes that this can go a long way in ensuring the economic sustainability of legal electricity connections.

3. Create a database on the urban poor

The study observed that there is a lack of statistical information on the energy coverage details of the urban poor, creating obstacles in formulating targeted plans, policies and programmes. It is therefore recommended that, through coordinated efforts, national governments and NGOs should build a strong database on urban energy access, covering variables such as coverage, available services, infrastructure, energy consumption, share and patterns of utilities usage, among others. This database could then be utilised in developing adequate and targeted policies, financing schemes and incentives.

4. Include monitoring and evaluation mechanisms in policies

Introducing policies, plans and programmes for energy access partly solves the problem, as policies may not always be implemented in the desired manner. It is therefore recommended that monitoring and evaluation mechanisms should be introduced at the policy formulation stage itself. The study observed some instances where certain checks were not built in while devising subsidy policies governing LPG supply, leading to a mismatch in the prescribed and actual size and price of the cylinder supplied (GNESD 2013e). It is recommended that national governments should close the gaps between the design and delivery phases of their policies by incorporating monitoring, evaluation and verification mechanisms into the policy formulation stage. This could lead to improvements in the quantity and quality of energy service and better price control.

5. Relax tenureship requirements for new electricity and LPG connections

The study identified the lack of land tenure and illegal status of slum-dwellers as one of the barriers to clean energy access. It is recommended that national governments, in conjunction

One stop shop for LPG cylinder and cooking stoves, Accra, Ghana. Photo courtesy of Gordon Mackenzie, UNEP DTU Partnership, 2012.

with supply agencies, should promote and allow tenureship alternatives in order to facilitate legal connections to electricity and improved access to LPG. For instance, voter ID cards and affidavits from a local ward councillor should be accepted as valid proof of residence documents for the issuance of connections. As highlighted in the 'Good practices' section, Thailand's initiative in issuing temporary residential proofs (quasi-household IDs) that enable access to clean energy connections for the urban poor can be replicated elsewhere.

6. Increase affordability

In order to address the affordability barrier, it is recommended that supply agencies should introduce mechanisms and measures directed to the end user's capacity to deal with high upfront costs. In the case of electricity, the recovery of the upfront costs in the form of easy instalments on a monthly basis and arrangements like prepaid connections are recommended. For LPG, smaller cylinders with low refill costs should be introduced, as this would help in paying for the LPG according to consumption needs and enhance affordability. These measures will not only reduce illegal connections but also support urban households in continuing to use the cleaner sources of energy once they have made the switch (GNESD 2013).

7. Expand and maintain supply infrastructure

It is recommended that, in order to meet the growing energy demands of urban and peri-urban areas, supply agencies must constantly plan and invest in the expansion and maintenance of the current grid and LPG supply chain. Certain innovative mechanisms can also be introduced to expand the supply chain. For instance, in Bangkok (as highlighted in the 'Good Practices' section), the rules were relaxed to enable grocery stores to sell LPG cylinders, which expanded the consumer base significantly.

8. Utilities should recognise the urban poor population as potential energy customers

It is recommended that both supply agencies and utility companies should recognise the urban poor population as potential energy consumers and engage in electrifying their settlements. One approach could be by defining electrification of low-income urban settlements to be mandatory in city distribution rights. Where the rights already exist, such obligations should be included at the time of contract renewals or when tariffs are revised. This will ensure that supply agencies are also reaching out to low-income settlements in urban and peri-urban areas (GNESD 2013).

9. Promote safety and energy efficiency by conducting awareness programmes involving NGOs and local communities

The inclusion and empowerment of NGOs and local communities as an important stakeholder group can help address the barrier of the 'lack of information and awareness'. This stakeholder group can act as a liaison between the supply agencies and urban poor energy consumers and help facilitate information campaigns to inform the urban poor about safety measures, efficient electricity and LPG consumption. There are several examples and case studies that demonstrate the role of NGOs and local communities in developing trust between the supply agencies and the urban poor energy consumers. Awareness programmes regarding energy efficiency measures are necessary to ensure that the expenditure on legal energy access remains affordable for the urban poor (GNESD 2013).

10. Promote renewable energy sources

National governments, NGOs and the private sector should deploy schemes based on alternative options like off-grid renewable energy programmes in poor urban settlements. For instance, solar appliances such as cookers, heaters, battery chargers and electricity capacitors could be introduced through pilot schemes. These programmes could later be up-scaled based on analyses of the socioeconomic benefits of the pilot projects. The replication of such measures would be dependent on the local context and the policy environment of the respective location of the intervention. In order to counter the potential upfront costs, the government may have to incorporate incentives for such schemes.

11. Revisit social tariffs

Besides the ten-point recommendations, the UPEA III study also observed that the threshold limit of social tariffs has not been changed for a long time, while the usage of appliances has increased (GNESD 2013). For instance, in South Africa, it has been observed by several NGOs and civil-society groups (e.g. Earthlife Africa 2010) that increased daily electricity consumption of poor urban households could not be fully covered by the subsidies provided. Research therefore was conducted to estimate the typical daily consumption requirements of households for essential energy services (defined in the study as space heating, lighting, hot water for cooking, cooking, warm water for washing and refrigeration). It was concluded from the results that the monthly consumption to meet these essential services would exceed the current units of electricity offered under the subsidy scheme (GNESD 2013d). It is therefore recommended that social tariff programmes be revisited to check their relevance regarding the present-day energy demands of the urban poor. However, considering the scale of poor households, it is also worth noting the significant fiscal challenges posed by altering the subsidy amount. Therefore, the cost-effectiveness of increasing a direct consumption subsidy becomes questionable from a national perspective, as it might not be the best means of achieving the overall social and economic objectives relating to energy access. Addressing this issue thus requires careful assessment and, as recommended earlier, educating the urban poor regarding energy-efficient measures and assisting them to invest in suitable energy-saving appliances seems to be one of the ways forward in this regard (GNESD 2013).

Moving towards the Energy Plus approach

There is a need to move away from an **'energy only'** approach, which merely focuses on improving the supply and consumption of energy in slum settlements, to an **'energy plus'** approach, as energy access should not be an end in itself. Rather, access to energy should provide the energy-poor with a means to improve their livelihoods and social well-being. For example, one of the key findings of this study has been the recognition of the importance of issues and policies beyond energy, which are equally critical in addressing the barriers identified in the introductory section of this paper. It is important to highlight that there seems to be a significant difference between potential access to modern energy service and the ability to use such services in an optimal manner. Other factors such as affordability and the ability to purchase energy-efficient appliances and reliability in the provision of the modern energy service all play crucial roles in determining the extent of access to energy services. Official figures on energy access are often based on a discrete binary system which defines energy access in terms of whether a household or community has the service or not (GFTR 2013). Such binary systems do not seem to capture the complexities and dynamisms involved in energy access (Singh et. al. 2014).

Some specific elements of the energy-plus approach were adopted in the UPEA III study, including socioeconomic mapping, assessments of specific energy needs in urban slums, the identification of energy consumption patterns, and the analysis of institutional structures, barriers and public awareness. Application of this concept to the energy access research theme also involves measuring and monitoring the impact of access to modern energy services so as to improve the livelihoods and socioeconomic development of the urban poor. To some extent, the current study has explored this facet by drawing links between the role of non-energy inputs (for example, supportive housing and slum upgrading policies) in supporting energy policies. It was not surprising to observe from the study's findings that unaffordability and illegal connections seem to prevail mostly in informal poor settlements in urban areas compared to formal settlements. Simply providing grid connections or clean cooking fuels to the urban poor does not bring transformational changes in their energy use, nor does it create lasting impacts on improving their livelihoods. Besides the availability of modern energy services, access to legal connections, increased affordability, quality assurance of energy services, sustainability and social benefits should all be taken into consideration in energy planning and policy-making. Therefore the concept of an 'energy plus' approach must be viewed in a broader context, with energy services being maximised for productive uses and income generation, which consequently increases the ability of the poor energy consumer to afford reliable modern energy services and improve the socioeconomic outcomes of such energy interventions. These findings also provide useful lessons for energy access in rural areas.

This also suggests that the complexity of energy access need to be further explored and thoroughly investigated. Based on the study's findings, concerted and integrated actions are recommended for successful adoption and implementation of the energy plus approach. To fully explore the integration of non-energy inputs into energy planning and policy-making and the application of an 'energy plus' approach, the following research areas are suggested for further investigation by researchers:

- Paradigm shift from a single-sector approach to a holistic multi-sectoral approach.
- Institutional and governance mechanisms for effective energy plus initiatives and the role of public–private partnerships.
- Scaling-up good practice energy access examples in appropriate applicable areas (GNESD 2013).

Annex 1. Summary table of recommendations

Annex 1. Summary of key recommendations and corresponding action points

Recommendation	Action points	Key actors
Recognise electricity as a basic service and provide enabling conditions for clean energy access	Introduce progressive housing policies and slum upgrading programmes	**National governments**
Clearly define the roles and responsibilities of nodal agencies responsible for energy provision	Carve out clear institutional mechanisms, roles and responsibilities; appoint nodal agencies; subsequently integrate these into policies	**National governments**
Create a database on the urban poor	Build a strong database on the urban poor in terms of their coverage, available services and infrastructure, actual consumption, share and pattern of usage of utilities, etc. This would help in developing targeted policies, financing schemes, subsidies etc.	**National governments; NGOs**
Include monitoring and evaluation mechanisms in policies	Prescribe monitoring, evaluation and verification mechanisms at the policy formulation stage to control the prices, quantity and quality of energy service	**National governments**
Relax tenureship requirements for new electricity/LPG connections	Promote and allow alternative tenureship arrangements like voter ID cards, affidavits from a local ward councillors, etc. to obtain electricity and LPG connections	**National governments in conjunction with supply agencies**
Increase affordability	Introduce mechanisms/measures like monthly instalments and prepaid connections for payment of upfront costs of electricity. For LPG, introduce small size cylinders (3-5kg)	**Supply agencies**
Expand and maintain supply infrastructure	Maintain and expand the existing electricity grid and LPG supply chain to adapt it to the growing demand of urban and peri-urban areas	**Supply agencies**
Utilities should recognise urban poor population as potential energy customers	Link city distribution rights can to the obligatory electrification of low-income urban settlements	**Supply agencies/utilities; National governments**
Promote safety and energy efficiency by conducting awareness programmes involving NGOs and local community	Undertake information campaigns to educate the urban poor about safety measures, efficient electricity and LPG consumption	**NGOs; Supply agencies**
Promote renewable energy sources	Alternative options like off-grid renewable energy programmes could be promoted in urban poor settlements	**National governments; Private sector; NGOs**

References

Adam, F. (2010). Free basic electricity: a better life for all. Sustainable Energy and Climate Change Project. Earthlife. Johannesburg. Accessed on 19th November 2014 at: http://earthlife.org.za/www/wp-content/uploads/2010/03/Free-Basic-Electricity-Final-Low-res.pdf

Cook, C.C., Duncan, T., Jitsuchon, S., Sharma, A., Guobao, W. (eds.) (2005). *Assessing the Impact of Transport and Energy Infrastructure on Poverty Reduction*. Asian Development Bank. Manila.

ESMAP (2011). *Improving energy access to the urban poor in developing countries.* White Paper for Energy Sector Management Assistance Programme (ESMAP), World Bank. Washington DC.

Energy Regulatory Commission (ERC) (2009). *Safe Handling of Liquefied Petroleum Gas Cylinders*. ERC, Nairobi.

Global Tracking Framework Report (2013). Sustainable Energy for All. International Energy Agency (IEA) and the World Bank, 289.

GNESD (2013). *Policy Synthesis Report*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III. Report prepared for Global Network on Energy for Sustainable Development by The Energy and Resources Institue (TERI). Accessed on 20th November 2014 at: http://www.gnesd.org/PUBLICATIONS/Urban-Peri-Urban-Theme

GNESD (2013a). *Country report (Thailand)*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III. Report prepared for Global Network on Energy for Sustainable Development by The Asian Institute of Technology (AIT). Accessed on 20th November 2014 at: http://www.gnesd.org/upload/gnesd/pdfs/upea%20iii/ait_final.pdf

GNESD (2013b). *Country report (Kenya)*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III. Report prepared for Global Network on Energy for Sustainable Development by The Energy, Environment and Development Network for Africa (AFREPREN/FWD). Accessed on 20th November 2014 at: http://www.gnesd.org/upload/gnesd/pdfs/upea%20iii/afrepren_final.pdf

GNESD (2013c). *Country report (Senegal)*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III. Report prepared for Global Network on Energy for Sustainable Development by Energy-Environment-Development Programme (ENDA). Accessed on 20th November 2014 at: http://www.gnesd.org/upload/gnesd/pdfs/upea%20iii/enda_final.pdf

GNESD (2013d). *Country report (South Africa)*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III. Report prepared for Global Network on Energy for Sustainable Development by Energy Research Centre, University of Cape Town (ERC). Accessed on 20th November 2014 at: http://www.gnesd.org/upload/gnesd/pdfs/upea%20iii/erc_final.pdf

GNESD (2013e). *Country report (Argentina)*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III. Report prepared for Global Network on Energy for Sustainable Development by Fundación Bariloche (FB). Accessed on 20th November 2014 at: http://www.gnesd.org/upload/gnesd/pdfs/upea%20iii/fb_final.pdf

GNESD (2013f). *Country report (India)*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III. Report prepared for Global Network on Energy for Sustainable Development by The Energy and Resources Institue (TERI). Accessed on 20th November 2014 at: http://www.gnesd.org/upload/gnesd/pdfs/upea%20iii/teri_final.pdf

GNESD (2013g). *Country report (Brazil)*. Energy poverty in developing countries' urban poor communities: assessments and recommendations. Urban and Peri-urban energy access III. Report prepared for Global Network on Energy for Sustainable Development by The Brazilian Reference Center on Biomass (CENBIO/IEE/USP), Centre for Integrated Studies on Climate Change and the Environment – (Centro Clima/COPPE/UFRJ) and The Polytechnic School of the State University of Pernambuco (POLICOM/POLI/UPE). Accessed on 20th November 2014 at: http://www.gnesd.org/PUBLICATIONS/Urban-Peri-Urban-Theme

Nyabundi D. (2012). Stima Loan helps poor families get electricity. *Business Daily*, 4th December 2012, Nairobi.

IEA (2013). World Energy Outlook 2013, IEA. doi: 10.1787/weo-2013-en

Singh, R., Wang, X., Mendoza, J.C., Ackom, E.K. (2014). *WIREs Energy Environ* 2014. doi: 10.1002/wene.148

The East African (2012). *Offshore plant to ease Kenya's gas woes*. Accessed on 1st December 2014 at: http://www.theeastafrican.co.ke/business/Offshore-plant-to-ease-Kenya-gas woes--/-/2560/1649760/-/60jbb0z/-/index.html

Thairath (2011). *The sale of LPG in Grocery shops*. Accessed on 20th November 2014 at: http://www.thairath.co.th/content/eco/202372

United Nations Development Account Projects (2011). *Global energy network for urban settlements: promoting energy access for the urban poor worldwide*. Accessed on 20th November 2014 at: http://www.un.org/esa/devaccount/projects/2008/0809S.html

ISBN: 978-87-93130-21-0